LICK OBSERVATORY BULLETIN

NUMBER 219

 DESCRIPTIONS OF 132 NEBULAE AND CLUSTERS PHOTOGRAPHED WITH
THE CROSSLEY REFLECTOR

Director Keeler's programme of nebular photography comprised one hundred and four of the brightest and most interesting objects of this class accessible from our latitude. Of this program, sixty-eight objects were reproduced in Volume VIII, *Publications of the Lick Observatory*, but no descriptions were published of the thirty-six objects which were not reproduced in Volume VIII. The present list describes these thirty-six objects, and ninety-six others which had not hitherto been examined photographically here, upon which exposures have been made with the Crossley Reflector from time to time, particularly during the past year.

As far as modern studies of nebular structure are concerned, it is not too extreme a statement to say that the visual observations of the past are almost valueless, even when made with powerful instruments by skillful observers. The amount of material for the study of nebular forms secured by photographic instruments of long focus is lamentably small in comparison with the number of objects still awaiting examination. These facts, and the growing interest

in studies of nebular structure and distribution, make it appear that the publication of this list will be of value to students in this field.

The list includes all nebulae and clusters photographed with the Crossley Reflector to date, omitting those of which reproductions were published in Volume VIII. Some of these may have been photographed elsewhere, but it is believed that the greater number have not hitherto been photographed with large-scale instruments.

The first column of the table contains the number of the object as given in Dreyer's *New General Catalogue of Nebulae and Clusters of Stars*; the second and third columns contain the right ascensions and declinations, as given by Dreyer, brought up to 1900. The column headed "Obs." gives the initials of the observer who took the negative; these were J. E. Keeler, C. D. Perrine, R. H. Curtiss and H. D. Curtis. The descriptions in the last column are by the writer.

HEBER D. CURTIS.

September 26, 1912.

N. G. C. No.	α	δ	Obs.	DESCRIPTION
83	0 16.1	+21 53	HDC	Thirteen nebulae are catalogued in this vicinity in the N. G. C.; in reality there are fifty or more small nebulae and nebulous stars. One is a small, but interesting, two-branched spiral about 1' in diameter.
157	0 29.7	— 8 57	HDC	A fine, condensed, patchy spiral 2.5 in length.
185	0 33.4	+47 47	JEK	Diameter about 3'; very irregular figure; binuclear.
205	0 34.9	+41 8	JEK	Diffuse, faint oval 8' long; center very much brighter, with traces of very indistinct ring formation about 1' in diameter; central star; two curious vacant spots; no certain evidence of a spiral character.
221	0 37.2	+40 19	JEK	Very bright; nearly round; the well-known companion south of the <i>Andromeda</i> nebula.
247	0 42.0	—21 18	RHC	Large, rather faint oval 16' in length; numerous condensations; probably a spiral.
524	1 19.6	+ 9 1	JEK	Round; about 45" in diameter; central star; extreme center very bright. Several interesting small elongated nebulae in this region.
895	2 16.6	— 5 59	HDC	A fine two-branched spiral about 4' long; the two main whorls are much brighter than the rest. N. G. C. 894 is given as 1' n. and 3" p. 895, and they are described as a "double nebula, connected," but 894 is evidently only a whorl of 895.

No. N. G. C.	α	δ	Obs.	DESCRIPTION
934	2 22.5	— 0 42	CDP	Described in the N. G. C. as vF, eS, O? A small, faint, nearly round nebula is near this place, but it is not a planetary.
936	2 22.5	— 1 36	HDC	Central star; an interesting <i>Saturn</i> -shaped central part is fairly bright and is about 1.5' long; outside is much fainter matter in spirals.
941	2 23.4	— 1 36	HDC	Nucleus; faint, patchy, oval center with fainter, outlying spiral whorls. Diameter about 2'.
972	2 28.3	+28 52	HDC	Small, very patchy and irregular oval; probably spiral; several strong condensations; curious vacant area about northern condensation.
1023	2 34.1	+38 38	JEK	Very much elongated, center very much brighter; 6' long; not spiral.
1084	2 41.1	— 8 0	CDP	Fairly bright, condensed, very patchy spiral, 2.5' long.
1300	3 15.2	—19 46	HDC	An unusually interesting two-branched spiral 6' long; whorls start abruptly from the extremities of straight extensions on each side of the nucleus. Figure in Publ. of the Astr. Soc. of the Pacific, October, 1912.
1535	4 9.6	—13 0	CDP	Bright, very symmetrical planetary; a nearly perfect ring surrounds the nucleus; outside this ring is fainter matter.
1555	4 16.1	+19 17	JEK	Region of <i>T Tauri</i> and Hind's variable nebula. Small, irregular, and excessively faint with exposure of four hours on Dec. 27, 1899.
418 (Sup.)	5 22.8	—12 46	CDP	Very small, bright planetary; stellar nucleus; nearly round.
1931	5 24.8	+34 10	JEK	Fairly bright; 3' long; very irregular; several stars involved; Dr. Aitken found considerable diffused nebulosity in this region.
.....	5 25.6	+30 22	CDP	<i>Nova Aurigae</i> . An exposure of nine and a half hours on Nov. 16-17, 1901, shows no evidence of exterior nebulosity.
2070	5 39.4	—69 9	HDC	Large, fairly bright, excessively irregular, with curious loops; many stars involved. Made with D. O. Mills Reflector at Santiago, Chile.
2239	6 25.6	+ 5 1	CDP	Cluster and nebula in <i>Monoceros</i> . An area nearly a degree square is filled with very irregular diffused nebulosity. Some curious rifts in N. E. portion. Barnard, A. N. 122, 253, 1889, gives a drawing from visual observations, depicting the main portion as a ring 40' in diameter. The negative shows but little resemblance to the drawing. Swift's nebula N. G. C. 2237 is a brighter patch in this region. Some of the brightest patches of nebulosity are around the central bright stars of the cluster.
.....	6 38.2	—30 3	CDP	<i>Nova Geminorum</i> . An exposure of 6 ^h 29 ^m on April 22-23-24, 1903, shows no evidence of nebulosity.
2287	6 42.7	—20 38	CDP	A large, very coarse cluster.
2359	7 12.9	—13 2	CDP	Very faint; diameter 7'; very irregular; looped or falcated structure.
2366	7 18.3	+69 13	CDP	Much elongated; quite irregular; many condensations; patchy; 6' long.
2371 2372	7 19.1	+29 41	CDP	The double nebula H II 316-7. Nucleus, on each side of which are very bright patches of matter, united by a loop; two fainter, elongated patches farther out. Doubtless a spiral. Diameter 2'.
2437	7 37.2	—14 35	CDP	A cluster of bright stars with involved faint diffused nebulosity.
2632	8 34	+20	CDP	<i>Praesepe</i> cluster. Stars not nebulous with exposure of two hours.
2808	9 10.0	—64 27	HDC	Exceedingly condensed cluster of faint stars. D. O. Mills Reflector, Santiago, Chile.
3003	9 42.6	+33 53	CDP	5' long; narrow; numerous condensations. Doubtless a spiral.
3079	9 55.2	+56 10	CDP	Quite bright; 8' long; greatly elongated; numerous condensations; doubtless edgewise spiral.
3156	10 7.5	+ 3 38	CDP	Small oval nebula; much brighter at center; uninteresting.
3165	10 8.1	+ 3 53	CDP	Faint, patchy oval, 1.5' long; not spiral.
3166	10 8.6	+ 3 55	CDP	Strong nucleus, surrounded by bright disk 1' in diameter in which some evidence of spiral structure is seen. Outside this, to diameter of 5', very faint matter; doubtless spiral.
3169	10 9.0	+ 3 57	CDP	Rather irregular, patchy spiral 4' long.
3184	10 12.2	+41 55	CDP	Beautiful; very regular spiral 6' in diameter; numerous condensations.
.....	10 21.1	+68 58	JEK	Coddington's new nebula in <i>Ursa Major</i> . Faint, elongated, about 4' by 12'; cf. Publ. Astr. Soc. Pacific 16, 123, 1893.
3293	10 29.6	—57 40	HDC	Coarse cluster. D. O. Mills Reflector, Santiago, Chile.
3372	10 41.2	—59 9	HDC	Nebulosity around η <i>Carinae</i> ; only a portion of this nebula is shown on plate; D. O. Mills Reflector, Santiago, Chile.
4147	12 5.0	+19 6	CDP	Bright, small, fairly condensed cluster.
4382	12 20.4	+18 45	CDP	Quite bright; strong nucleus; oval, about 4' long; no spiral structure.
4394	12 20.9	+18 46	CDP	A small, interesting spiral; straight line of matter forms axis from which whorls proceed, somewhat as in N. G. C. 1300 and 5921. About 4' in extreme diameter.
4527	12 29.0	+ 3 12	CDP	Fine elongated, somewhat patchy spiral 5' long.
4656 4657	12 39.1	+32 43	CDP	4656 is quite bright, 12' long, 2' wide; rather irregular structure with numerous condensations; perhaps an edgewise spiral. 4657 is a slightly falcated wisp of nebulosity about 8' long.
5024	13 8.0	+18 42	CDP	Fine compact cluster.
5139	13 20.8	—46 47	HDC	ω <i>Centauri</i> cluster. Taken with the D. O. Mills Reflector, Santiago, Chile; reproduced in Vol. II of See's <i>Evolutions of the Stellar System</i> , Plate I.
5247	13 32.6	—17 22	CDP	Fine spiral about 5' in diameter.

N. G. C. No.	α	δ	Obs.	DESCRIPTION
5921	15 17.0	+ 5 26	HDC	Very interesting spiral. Fairly strong nucleus, about which is an oval 1'8 long, whose longer axis is crossed by a straight lane of matter; from the ends of this oval spring the two main whorls of the spiral; other fainter whorls are visible. Diameter about 5'. Figure in Publ. Astr. Soc. of the Pacific, October, 1912.
6093	16 11.1	-22 44	CDP	Fine, small, condensed cluster.
6171	16 26.9	-12 50	CDP	Fine, small, fairly condensed cluster.
6181	16 28.0	+20 2	HDC	A small spiral perhaps 2' over all.
6210	16 40.3	+23 59	HDC	Very bright planetary nebula. Long exposure shows a faint ansa on each side in which two condensations are involved; no other outer nebulosity.
6229	16 44.2	+47 42	CDP	Small, greatly condensed cluster.
6254	16 51.9	- 3 57	CDP	A beautiful cluster about 10' in diameter.
6266	16 54.8	-29 58	CDP	Fine, condensed cluster.
6287	16 59.1	-22 34	CDP	Small, rather open cluster.
6333	17 13.3	-18 25	CDP	Small, condensed cluster.
6341	17 14.1	+43 15	CDP	Large, very compact cluster; a fine object.
6356	17 17.8	-17 43	CDP	Small, compact cluster.
6369	17 23.2	-23 41	CDP	Annular, fairly bright, has central star.
6402	17 32.4	- 3 11	CDP	Fine, condensed cluster.
6412	17 32.7	+75 47	JEK	Small, rather faint spiral nearly 2' in diameter.
6482	17 47.6	+23 6	HDC	Very small, has been drawn as binuclear, but the involved star of about magn. 12 does not appear to be physically connected with it.
6517	17 56.4	- 8 57	HDC	Apparently a very small cluster, much condensed at center; can not be determined with certainty whether nebulosity exists near center or not.
6543	17 58.6	+66 38	HDC	Very bright planetary; long exposure shows very minute pointed ansae, but no outer nebulosity.
6569	18 7.2	-31 51	CDP	Small, rather compact cluster.
6572	18 7.2	+ 6 50	HDC	Bright, small, slightly oval planetary; long exposure shows no outer nebulosity.
6574	18 7.3	+14 58	HDC	Oval, condensed, patchy spiral about 1'4 long.
6624	18 17.3	-30 24	CDP	Small, compact cluster.
6626	18 18.4	-24 55	CDP	Fine compact cluster.
6643	18 22.6	+74 31	HDC	Rather faint spiral about 3' long; numerous condensations.
6637	18 24.8	-32 25	CDP	Small, compact cluster.
6642	18 25.8	-23 32	CDP	Large, beautiful cluster; a fine object.
6656	18 30.3	-23 59	CDP	Fine globular cluster.
6681	18 36.7	-32 23	CDP	Small, rather coarse cluster.
6705	18 45.7	- 6 23	CDP	Large, rather open cluster.
6712	18 47.6	- 8 50	CDP	Quite small globular cluster.
6715	18 48.7	-30 36	CDP	A small cluster about 2' in diameter; excessively condensed at center.
6760	19 6.1	+ 0 52	HDC	A small cluster of very faint stars; not a nebula as described in the N. G. C. An irregular rift near central part.
6772	19 9.4	- 2 53	HDC	Faint, small, oval ring about 1'2 long; has central star, and closely resembles the Ring Nebula in <i>Lyra</i> .
6779	19 12.7	+30 0	CDP	Small, somewhat condensed cluster.
6781	19 13.6	+ 6 21	CDP	Nearly round; 1'8 in diameter; quite faint; central star; slightly brighter ring forms about three-fourths of the outer boundary; not a typical planetary.
6809	19 33.7	-31 10	CDP	Fine globular cluster 10' in diameter; not greatly condensed at center.
6814	19 37.2	-10 33	HDC	A small, faint spiral; diameter 2'.
6818	19 38.3	-14 24	HDC	Bright planetary. Short exposures show irregular oval ring somewhat like Ring Nebula in <i>Lyra</i> ; has very faint central star; long exposure shows no evidence of outer nebulosity.
6826	19 42.1	+50 17	HDC	Very bright, slightly oval planetary; faint central star or nucleus; no extensions with long exposure.
6838	19 49.3	+18 31	CDP	Rather open cluster of faint stars.
6864	20 0.2	-22 12	CDP	Small, bright cluster, greatly condensed at center.
6888	20 8.8	+38 6	HDC	An irregular, crescent-shaped band of nebulosity 18' long; network formation.
6905	20 17.9	+19 47	HDC	Nearly round planetary with central star; disk patchy. Long exposure shows very faint extensions, in the southern of which a 12 ^m star is apparently involved.
1317 (Sup.)	20 18.2	+ 0 20	CDP	Faint planetary about 15" in diameter.
6914	20 21.3	+42 10	HDC	Very irregular diffuse nebulosity about 4' across. There is also fairly bright nebulosity about the neighboring stars BD + 41° 3731 and 3737, which is not noted in the N. G. C. That about 3737 is brighter than N. G. C. 6914.
6934	20 29.3	+ 7 4	CDP	Small, condensed, globular cluster.
6951	20 35.8	+65 45	JEK	Rather faint symmetrical spiral about 3'5 across.
6960	20 41.5	+30 21	HDC	A wonderful object, over a degree in length, composed of bright filaments like the "Net-work" nebula.
6981	20 48.0	-12 55	CDP	A small, bright, rather open cluster.

N. G. C. No.	α	δ	Obs.	DESCRIPTION
7000	20 55.2	+43 56	HDC	The "America" nebula; too large to be recorded by the Crossley Reflector except in sections. The "Isthmus" region is full of interesting detail; the "Canada" region is a mass of diffuse nebulosity with no detailed structure and is of little interest.
7006	20 56.8	+15 48	HDC	A very small compact cluster of faint stars; probably no nebulosity.
7008	20 57.6	+54 10	JEK	Fairly bright; roughly oval; 1'5 long; structure is quite irregular and bears little resemblance to published descriptions.
7009	20 58.7	-11 46	HDC	Long exposure shows no outer nebulosity in this well-known planetary.
7026	21 2.9	+47 27	HDC	The N. G. C. describes this planetary as binuclear. Short exposure with fine-grained plates shows that it is rather composed of a central star flanked on each side by two bright masses of nebulosity, connected by fainter matter in the form of a small ring. Long exposure shows no distant nebulosity; total length about 15".
7027	21 3.3	+41 50	HDC	Binuclear planetary; long exposure shows no outer nebulosity.
7044	21 9.2	+42 5	HDC	A coarse, faint cluster.
7052	21 14.2	+26 2	HDC	Very small, slightly oval; much brighter at center.
7078	21 25.2	+11 44	JEK	A large, very rich, condensed cluster.
7089	21 28.3	-1 16	JEK	Fine, condensed cluster of small stars.
7099	21 34.7	-23 38	CDP	Small, bright, rather coarse cluster.
7116	21 38.2	+28 30	HDC	Very faint and small; binuclear.
7129	21 40.7	+65 39	HDC	5' long by 4' broad; numerous stars involved; structure quite irregular; an imperfect oval ring or perhaps an irregular spiral.
7133	21 42.1	+65 42	HDC	Very faint, nearly round; 1/2 diameter; about 12 ^m star.
7142	21 43.5	+65 21	HDC	Large, very coarse cluster of stars 11th to 15th magnitudes.
7177	21 55.9	+17 16	CDP	Condensed, rather bright spiral 3' long.
7180	21 56.7	-21 2	HDC	Small oval, much brighter in middle; perhaps spiral.
7184	21 57.1	-21 18	HDC	Fine elongated spiral about 5' by 1'.
7185	21 57.4	-20 57	HDC	Small; bright center; slightly oval; uninteresting.
7293	22 24.3	-21 21	HDC	A unique and wonderful object; nearly two turns of a helix; the whorl is about 10' in diameter, and the formation about 13' in extreme diameter. Described with cut, in Publ. of the Astr. Soc. of the Pacific for October, 1912.
.....	22 32.2	+52 15	HDC	<i>Nova Lacertae</i> . Long exposure (1912, Sept. 13) shows no nebulosity.
7354	22 36.6	+60 46	HDC	Diameter about 30". An irregular oval ring, fading out at the ends of its longer axis, surrounds a faint central star; fainter material about and within ring.
7371	22 40.8	-11 32	HDC	A very faint, nearly round spiral about 1' in diameter; central star of 11 ^m .
7393	22 46.4	-6 5	HDC	An unsymmetrical oval ring about 1' long, with several condensations and an eccentrically placed central star; much fainter material outside in longer axis of oval.
7431 } 7433 } 7435 } 7436 }	22 53.2	+25 37	HDC	Numerous small, faint nebulae in this region; none of any interest.
7448	22 55.1	+15 27	JEK	Small, condensed, patchy spiral 1'6 long.
7457	22 56.2	+29 36	HDC	Elongated oval; 2' in length; very much brighter at center; no evidence of spiral nature. A similar, much fainter nebula is about 8' distant, n.f., not catalogued in the N. G. C.
7492	23 3.2	-16 10	HDC	A faint, very open cluster.
7537 } 7541 }	23 9.5	+3 57	JEK	2' and 3' long, respectively. Each of these is probably a spiral seen edgewise.
7662	23 21.1	+41 59	HDC	Well-known planetary; long exposure shows very minute projections like ansae, but no outer nebulosity.
7782	23 48.8	+7 25	JEK	Small spiral; whorls not very distinct.
7817	23 58.9	+20 12	JEK	Fine, small, edgewise spiral.